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SCIENTIFIC INVESTIGATION SUPPORT

CODE 902.6

LANDSAT INVESTIGATION NO. 28960

ITEM NO. 1

12 & 3rd QTR

7.8-10.387

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DAF-702100  
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LANDSAT FOLLOW-UP INVESTIGATION PROGRAM

PROJECT 28960, 2896A

Survey of Capeweed Distribution in Australia in relation to  
Climate, Landforms, Soil Types and Management Practices.

INVESTIGATORS : Dr. Graham W. Arnold  
Dr. Frank R. Honey *ento*

CSIRO Division of Land Resources Management,  
Private Mail Bag,  
P.O. WEMBLEY, 6014  
Western Australia.

OBJECTIVES :

To use the LANDSAT MSS data and imagery to enable the  
general distribution and time of flowering of capeweed,  
arctotheca calendula, to be mapped in relation to:

- (a) Land Forms.
- (b) Major Soil Types.
- (c) Average Rainfall.
- (d) Temperature.
- (e) Length of Average Wet Season.
- (f) Time of First Rains.
- (g) Land Use.

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SIS/902.6

(E76-10387) SURVEY OF CAPEWEED DISTRIBUTION  
IN AUSTRALIA IN RELATION TO CLIMATE,  
LANDFORMS, SOIL TYPES AND MANAGEMENT  
PRACTICES (Commonwealth Scientific and  
Industrial Research) 7 p HC \$3.50 CSCL 08F G3/43  
Unclas 09387  
N76-29661

### TECHNIQUES

Due to the large area to be covered in this investigation, three sub-areas were chosen. These are illustrated in Diag. 1.

Area 1, comprising the South-West of Western Australia, was the principal area for the investigation. The capeweed distribution in a portion of this area is known from colour aerial photography. Within this area, the most detailed effort was undertaken at Bakers Hill, 80 km East of Perth, Western Australia.

The capeweed distribution areas 2 and 3, in central southern Australia and south-eastern Australia respectively, are not known in any detail. These areas will provide for testing signatures and techniques developed in area 1.

The total imagery recorded for this investigation is indicated in Diag. 2. The number of suitable images is greater for area 3 than for 1 or 2, due primarily to adverse weather conditions (excessive cloud) over areas 1 and 2.

Imagery Products Utilised: For initial evaluation, 70 mm +ve transparencies were used. These were studied both by projecting, and by examination under a microscope, to assess

- (i) the amount of detail;
- (ii) the ability to locate the Bakers Hill site.

Based on this evaluation of the imagery, computer compatible tapes were ordered for three scenes in area 1.

Aerial Photography: 70 mm colour aerial photography was taken close to the overpass of LANDSAT B over the Bakers Hill site. Capeweed areas were obvious on this photography.

Ground Measurements: Reflectance data on the soils, capeweed and pasture species in the area was recorded using EXOTECH LANDSAT equivalent radiometers, with freshly prepared barium sulphate as a reflectance standard. In addition, reflectance measurements were carried out on some extensive areas of beach sand 120 km north of Perth, Western Australia, for use as secondary reflectance standards to convert the satellite data to reflectance. These areas of sand are large, uniform and obvious on the LANDSAT images.

The reflectance data is presented in Table 1.

#### ACCOMPLISHMENTS

The LANDSAT imagery of the area around Bakers Hill has excellent detail - minor roads and creeks could be located, enabling an accurate fix on the test sites.

The imagery of the individual lands did not appear to resolve the capeweed areas from the other pastures. It is hoped that analysis of the CCT data will be more successful.

Significant Results: The ground measurements of the reflectivity of the capeweed species shows significant variation from the pasture species measured. The variation in the capeweed signature, as a function of the flower cover indicates that the optimum time for a survey would be when the capeweed is at peak flowering.

Publications: Nil.

Problems: The quantity of imagery was inadequate, due mainly to adverse weather conditions. Only one set of clear images was obtained for the primary site.

Data Quality and Delivery: Imagery quality was satisfactory. No CCT data prior to this Report.

Recommendations: Nil

Conclusions: The quality and spatial coverage of the LANDSAT imagery should make it suitable for extensive surveys to map species such as capeweed, provided sufficient temporal cover is obtained; i.e. multiple 18-day coverage, weather permitting.

F.R. HONEY

26 July, 1976.  
FRH:CM

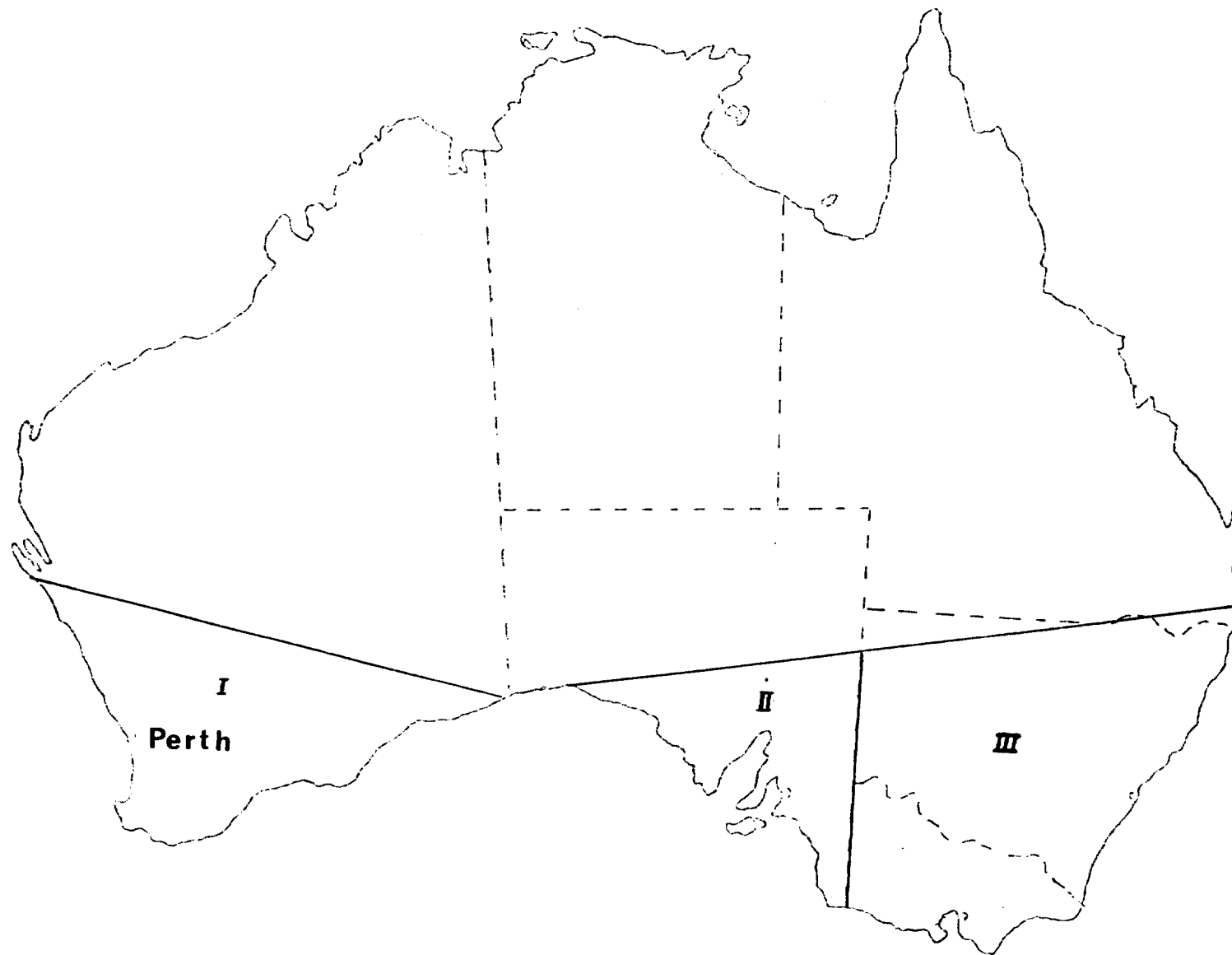


DIAGRAM 1 : AREAS SELECTED FOR CAPEWEED DISTRIBUTION INVESTIGATION

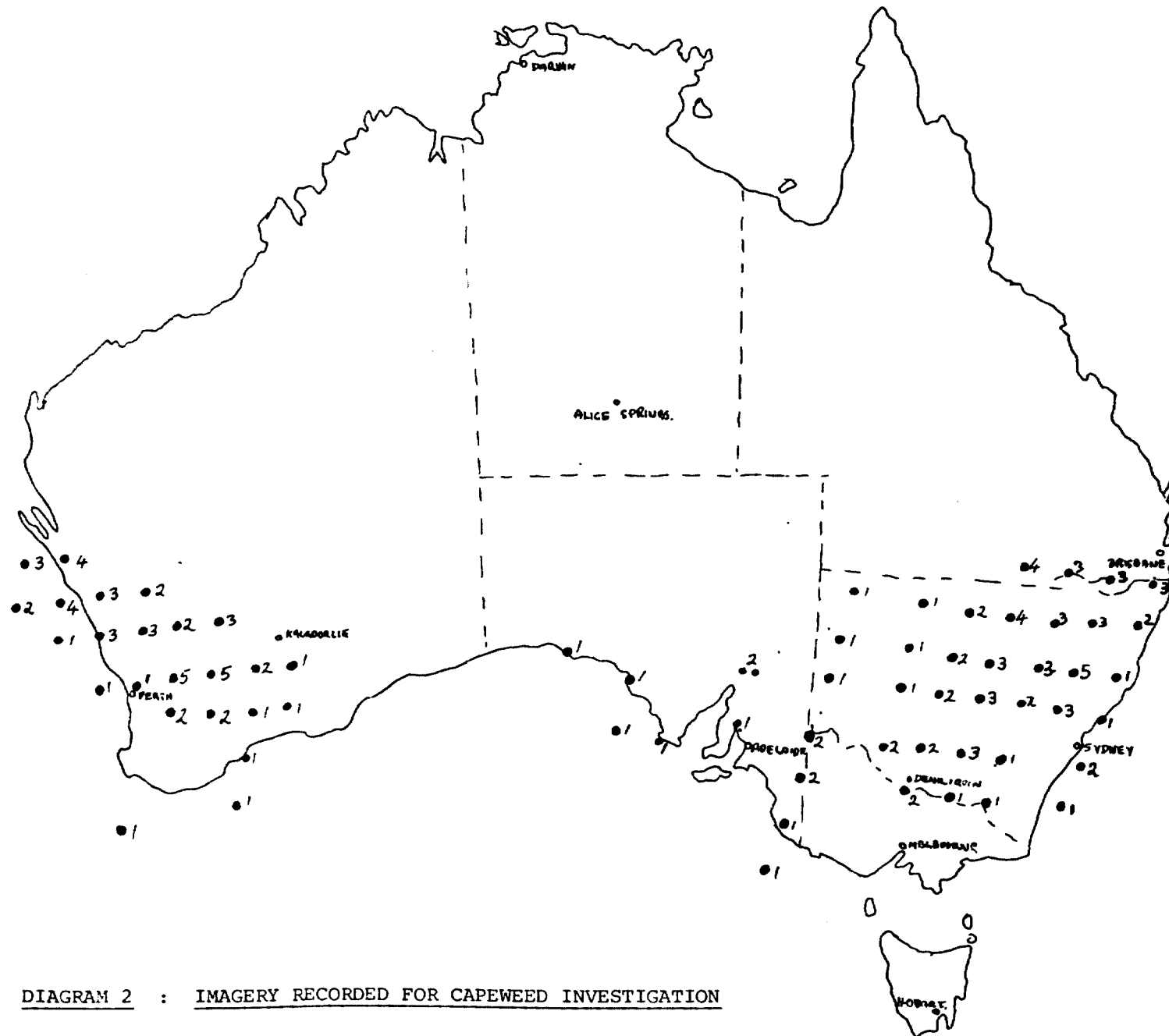


DIAGRAM 2 : IMAGERY RECORDED FOR CAPEWEED INVESTIGATION

Table 1 : Mean, normalized reflectance data (relative to barium sulphate) for capeweed, clover and Wimmera rye grass, and two soil types at the Bakers Hill site.

SPECIES	DATE	NORMALIZED REFLECTANCES							
		CH4	SCH4	CH5	SCH5	CH6	SCH6	CH7	SCH7
Gravelley Soils	26 Aug 75	13.10	1.22	21.55	0.73	29.85	0.03	35.51	1.92
	13 Sep 75	14.20	2.73	17.73	3.29	31.38	3.45	35.92	5.35
Grey Sands	26 Aug 75	18.59	2.61	20.89	0.86	26.82	0.15	33.47	2.55
	13 Sep 75	18.13	1.43	20.23	2.73	29.05	0.60	32.55	4.70
Capeweed	26 Aug 75	5.25	-	3.39	-	50.25	-	41.12	-
Capeweed (Pots)	17 Sep 75	10.92	3.95	13.52	1.64	39.58	3.19	36.11	3.12
Capeweed, 10% Flower	17 Sep 75	9.76	-	8.39	-	35.20	-	46.65	-
20% Flower		9.77	-	8.78	-	35.41	-	46.04	-
30% Flower		9.94	-	9.79	-	35.52	-	45.76	-
40% Flower		10.67	-	11.70	-	33.62	-	44.01	-
50% Flower		11.52	-	12.93	-	32.65	-	42.90	-
60% Flower		12.01	-	13.78	-	32.13	-	42.07	-
70% Flower		12.31	-	13.37	-	32.12	-	42.19	-
80% Flower		12.99	-	13.78	-	31.59	-	41.64	-
90% Flower		13.42	-	14.22	-	32.16	-	40.20	-
100% Flower		13.90	-	15.34	-	31.11	-	39.65	-
Immature Capeweed	17 Sep 75	8.52	-	6.43	-	44.49	-	40.56	-
Capeweed	13 Sep 75	10.90	2.62	10.76	2.92	43.59	3.53	34.76	2.41
Capeweed	26 Sep 75	9.01	1.86	8.79	1.85	41.36	0.78	40.85	2.93
Wimmera Rye Grass	13 Sep 75	7.10	1.52	6.12	2.54	48.97	2.33	37.80	1.72
Wimmera Rye Grass	17 Sep 75	5.40	2.11	4.95	1.28	46.41	2.52	43.27	0.97
Clover	17 Sep 75	7.81	0.52	5.58	0.32	46.35	0.44	40.26	0.32
Clover (Pots)	26 Sep 75	6.49	0.47	4.80	0.69	45.52	1.46	43.19	0.30

CHN = Mean Reflectance  
SCHN = Standard Deviation